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BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES

Application Number: 09/955,297
Filing Date: September 19, 2001
Appellant(s): ROHR ET AL.

Stanley Spooner
For Appellant

SUPPLEMENTAL EXAMINER'S ANSWER

This is in response to the appeal brief filed November 22, 2004 and the remand to the examiner mailed May 31, 2005.

(11) Response to Argument

At page 3, lines 5-8, of the Remand, it is stated that "the examiner must respond to this remand by clarifying whether the above noted exhibit [i.e., EXHIBIT 1] has been entered and considered along with the reply brief attached thereto." In response, the Examiner notes that EXHIBIT 1 in the reply brief has been entered and considered. Said EXIBIT 1 is discussed below in response to appellant's arguments in the reply brief.

1. Response to Appellant's argument that strain is not the same as stress.

Appellant argues that strain is not the same as stress, and that it is incorrect to say that because Ekins-Daukes et al suggests that the strain in a period be minimized, stress in the period must also be minimized. Appellant argues that if two materials have different Hooke's law constants *k*, i.e., k_1, k_2, and if those materials are strained the same amount due to a difference in Hooke's law constant, the resultant stress will be different. Appellant argues that the Examiner erroneously concludes that "a negligible quantity of stain provides a negligible shear force". Appellant's arguments are well taken, but they are not deemed to be persuasive because Ekins-Daukes et al's solar cell, grown on GaAs substrate, has the multiquantum well structure with $GaAs_{0.939}P_{0.061}$ barrier and $In_{0.17}Ga_{0.83}As$ well (see the right column on page 4194, and Fig. 1). Appellant has not shown there would be a substantial difference in Hooke's law constant for the GaAs, $GaAs_{0.939}P_{0.061}$ barrier and $In_{0.17}Ga_{0.83}As$ well so that there would be substantial shear force. The compressive strain of the $In_{0.17}Ga_{0.83}As$ well is matched by the tensile strain in the $GaAs_{0.939}P_{0.061}$ barrier so that there is strain balance (see the

last paragraph at the left column on page 4195). It is acknowledged that Hooke's law constant and lattice constant are different constants, but, from instant Figure 7 it is seen that GaAs has a lattice constant of about 5.65 angstroms. The $GaAs_{0.939}P_{0.061}$ will be on the line between the GaP and GaAs data points in said Figure 7, and indeed, will be very close to but to the left of said GaAs data point and on said line. Likewise, the $In_{0.17}Ga_{0.83}As$ will be on the line between the InAs and GaAs data points in said Figure 7, and indeed, will be close to but to the right of said GaAs data point and on the line between the InAs and GaAs. In other words, there will be very little difference between the lattice constants for the GaAs, $GaAs_{0.939}P_{0.061}$, and $In_{0.17}Ga_{0.83}As$. The same can be said for the strain compensated quantum well in instant Table I, where InP is the substrate, the barrier is $In_{0.45}Ga_{0.55}As$ and $In_{0.47}Ga_{0.53}As$, and the well is $In_{0.62}Ga_{0.38}As$. The $In_{0.45}Ga_{0.55}As$, $In_{0.47}Ga_{0.53}As$, and $In_{0.62}Ga_{0.38}As$ have lattice constants very close to the $In_{0.53}Ga_{0.47}As$ seen at the arrow in said Figure 7, and said $In_{0.53}Ga_{0.47}As$ has the same lattice constant as InP. Accordingly, it is the Examiner's position that Ekins-Daukes et al's multiquantum well $GaAs_{0.939}P_{0.061}$ and $In_{0.17}Ga_{0.83}As$ on GaAs substrate inherently has zero-stress condition or substantially zero stress, and thus, there will be substantially no shear force as here claimed. Indeed, according to the instant specification, in order for there to be no shear force, the equation for zero stress condition is $\varepsilon_1 t_1 A_1 a_2 + \varepsilon_2 t_2 A_2 a_1 = 0$, wherein $\varepsilon_i = (a_0 - a_i)/a_i$ and a_0 is the lattice constant of the substrate and a_i is the natural unstrained lattice constant of layer i (see pages 11 and 12). For Ekins-Daukes et al's $GaAs_{0.939}P_{0.061}$ barrier and $In_{0.17}Ga_{0.83}As$ well with GaAs substrate, the lattice constant a_0 for the GaAs substrate is very close to the lattice

constant a_1 and a_2 for the $GaAs_{0.939}P_{0.061}$ barrier and $In_{0.17}Ga_{0.83}As$ quantum well, and thus, ε_1 and ε_2 are very close to or essentially zero.

2. Response to Appellant's argument that Appellant's independent claim requires "substantially no shear force".

Appellant argues that the instant independent claim requires "substantially no shear force" and not substantially no shear strain, and that the Examiner has misunderstood the difference between stress and strain. However, this argument is not deemed to be persuasive because, as noted above, Ekins-Daukes et al's multiquantum well $GaAs_{0.939}P_{0.061}$ and $In_{0.17}Ga_{0.83}As$ on GaAs substrate inherently has the claimed property of substantially no shear force on a neighboring structure.

3. Response to Appellant's argument that a zero strain configuration as taught in Ekins-Daukes et al is not the same as a substantially zero stress combination.

Appellant argues that a zero strain configuration as taught in Ekins-Daukes et al is not the same as a substantially zero stress combination. Appellant argues that the Examiner misunderstood Appellants' Appeal Brief (dated 07/12/04) in the paragraph bridging pages 13 and 14, that Appellant was not saying that the example of +4 and –4 strain is taught in Ekins-Daukes et al, and that what is taught in Ekins-Daukes et al is that one wishes to have average strain be zero or at least minimized. Appellant argues that the Examiner does not appreciate that different materials have different Hooke's law constants. Appellant cites EXHIBIT 1 accompanying the Reply Brief filed November 22, 2004 to demonstrate that it is possible to have zero strain yet substantial stress relationships. Appellant argues that Ekins-Daukes et al's arrangement is shown in

Figures (a) and (b) in said EXHIBIT 1, while the claimed invention is shown in Figures (c) and (d) of said EXHIBIT 1. However, Appellant's arguments are not deemed to be persuasive because Ekins-Daukes et al prepares a specific multiquantum well solar cell, i.e., the solar cell having a GaAs substrate with the multiquantum well $GaAs_{0.939}P_{0.061}$ and $In_{0.17}Ga_{0.83}As$. As noted above, it is the Examiner's position that Ekins-Daukes et al's multiquantum well $GaAs_{0.939}P_{0.061}$ and $In_{0.17}Ga_{0.83}As$ on GaAs substrate inherently has the claimed property of substantially no shear force on a neighboring structure. Neither the hypothetical example in said Appeal Brief in the paragraph bridging pages 13 and 14, nor the hypothetical drawings in EXHIBIT 1 represent a fair comparison with Ekins-Daukes et al's multiquantum well $GaAs_{0.939}P_{0.061}$ and $In_{0.17}Ga_{0.83}As$ on GaAs. Ekins-Daukes et al's multiquantum well $GaAs_{0.939}P_{0.061}$ and $In_{0.17}Ga_{0.83}As$ on GaAs is a solar cell that can be prepared, and nothing in said example in said Appeal Brief or said EXHIBIT 1 reflects the properties or structure of Ekins-Daukes et al's exact device.

4. Response to Appellant's argument that the Examiner has clearly ignored paragraph 12 of Dr. Anderson's Declaration.

Appellant argues that the Examiner has clearly ignored paragraph 12 of Dr. Anderson's declaration filed July 22, 2003. Said paragraph states that the Ekins-Daukes et al "disclosure teaches that the thickness-weighted average lattice constant of well and barriers is roughly the same as the InP substrate but this is insufficiently exact to ensure periods which exert 'substantially no shear force on a neighboring structure.'" However, this argument is not deemed to be persuasive because said paragraph 12 does not address the exact solar cell prepared in Ekins-Daukes et al, i.e., the

multiquantum well $GaAs_{0.939}P_{0.061}$ and $In_{0.17}Ga_{0.83}As$ on GaAs substrate. As noted above, Ekins-Daukes et al's multiquantum well $GaAs_{0.939}P_{0.061}$ and $In_{0.17}Ga_{0.83}As$ on GaAs substrate inherently has the claimed property of substantially no shear force on a neighboring structure.

For the above reasons, it is believed that the rejections should be sustained.

Respectfully submitted,

Alan Diamond
Primary Examiner
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Alan Diamond
August 4, 2005

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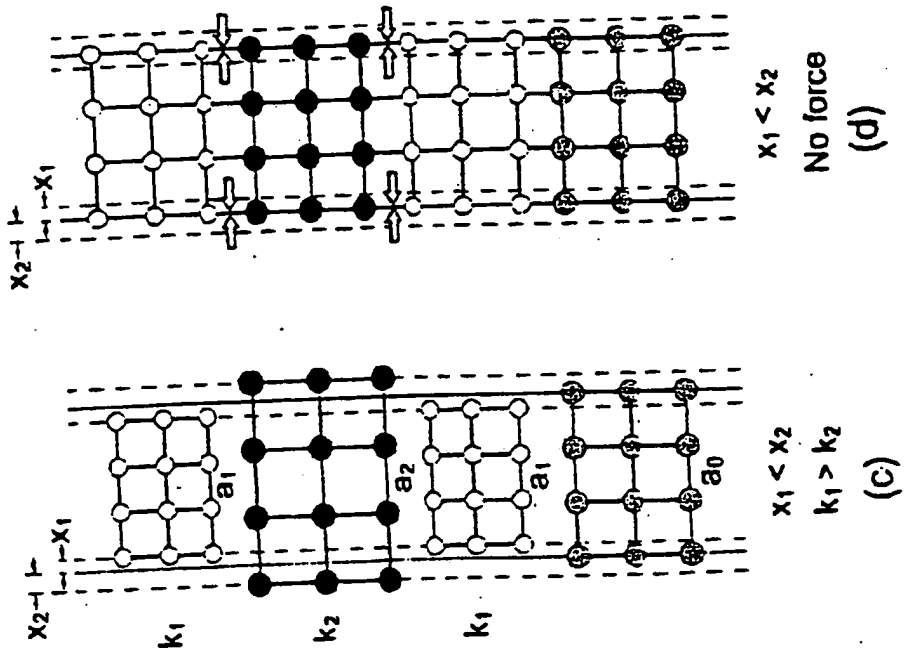

EXHIBIT

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